

Mye liv i den polare natten

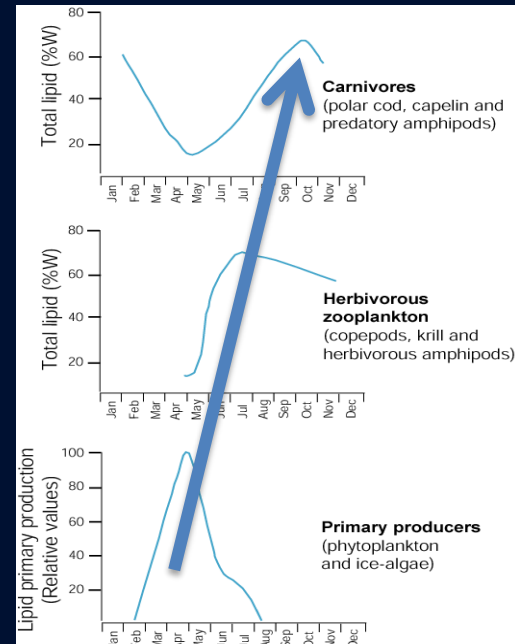
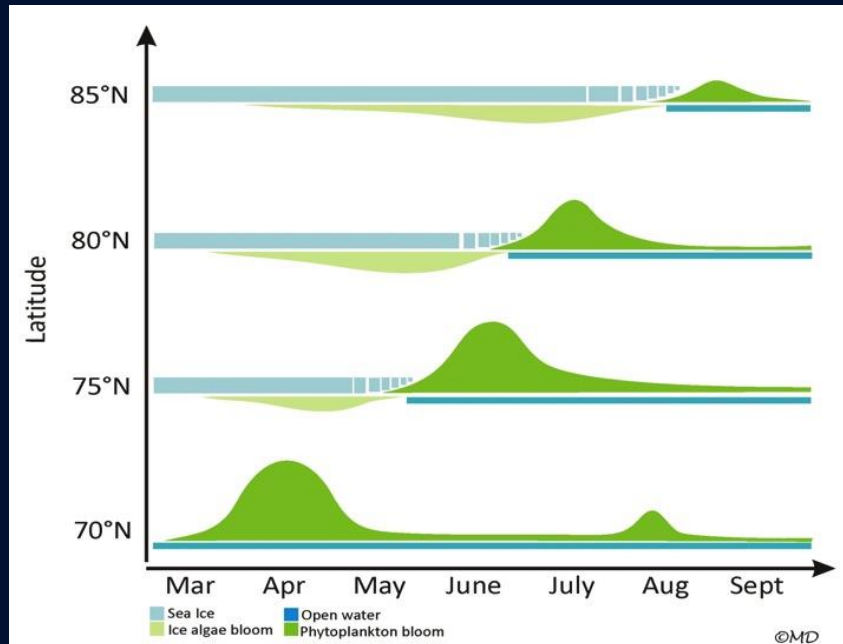


Malin Daase, post doc

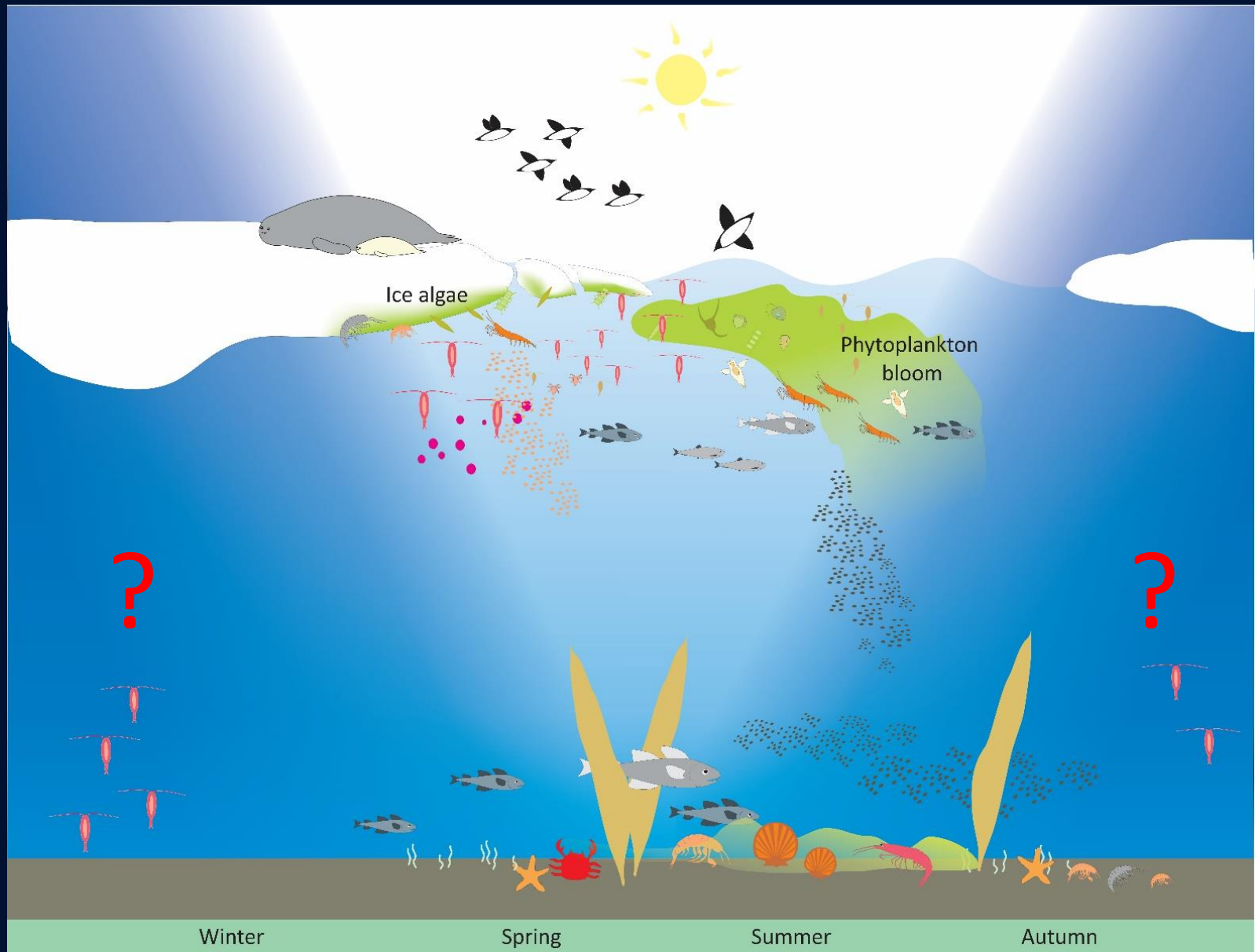
UiT The Arctic University of Norway
Faculty for Biosciences, Fisheries and Economics
Department for Arctic and Marine Biology

The marine Arctic

- Processes regulated by a unique light regime (sun and ice)
- Pulses of energy
- Fundamental connections and interactions relatively poorly known, especially during the dark polar night



Arctic marine ecosystem



Arctic marine ecosystems: **The classical paradigm**

Absence of light → no primary production



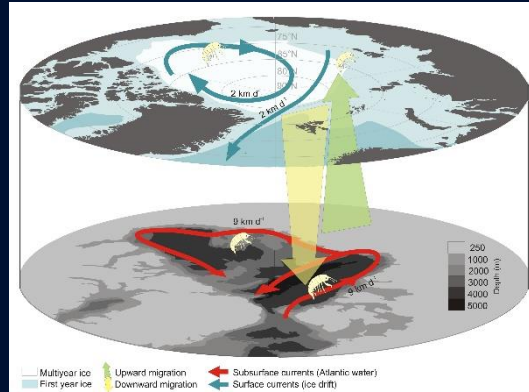
Biological processes / activity are turned off

The polar night is a biological desert

The polar night represent one of the major gaps in knowledge regarding our understanding of high latitude ecosystems

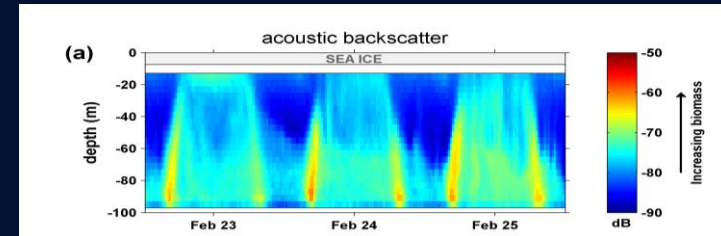
The classical paradigm of a biological desert contradicted by a number of basic discoveries during the last years:

Bioluminescence



Ice fauna life cycles

Berge et al 2012



Diel vertical migration during polar night

Berge et al. 2009

Benthic reproduction



Nahrgang et al. 2014



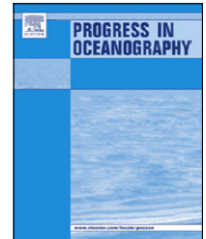


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In the dark: A review of ecosystem processes during the Arctic polar night

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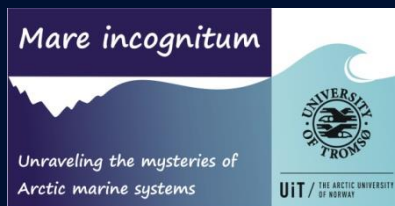


Marine Night

Objective:

to achieve a basic understanding of Arctic biodiversity and food web structure during the polar night, and how ecological processes from reproduction and growth to trophic interactions and life-history processes during this nearly unstudied time contribute to functioning of Arctic ecosystems

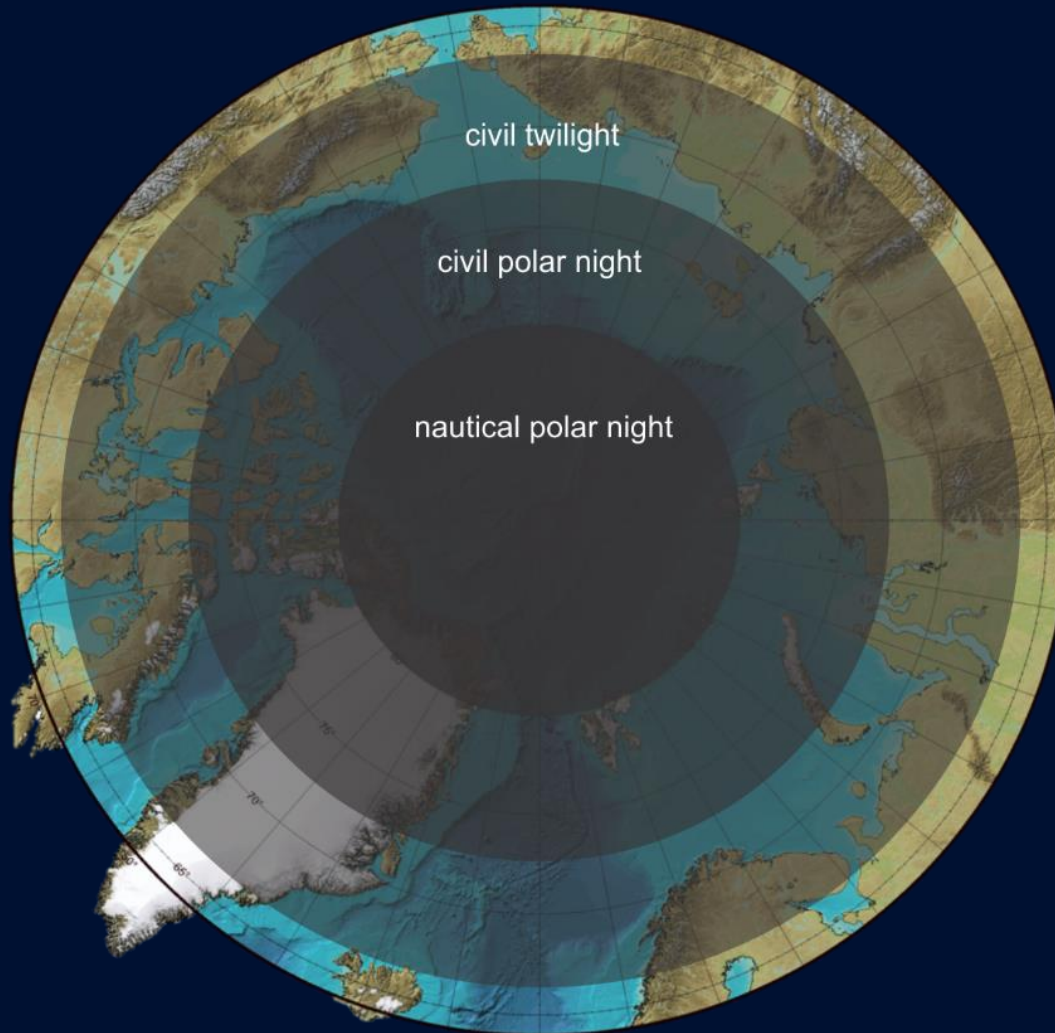
Project Leader: Jørgen Berge, University in Tromsø / UNIS



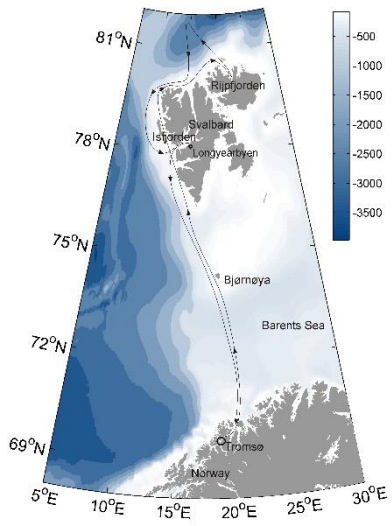
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Polar night \neq Polar night

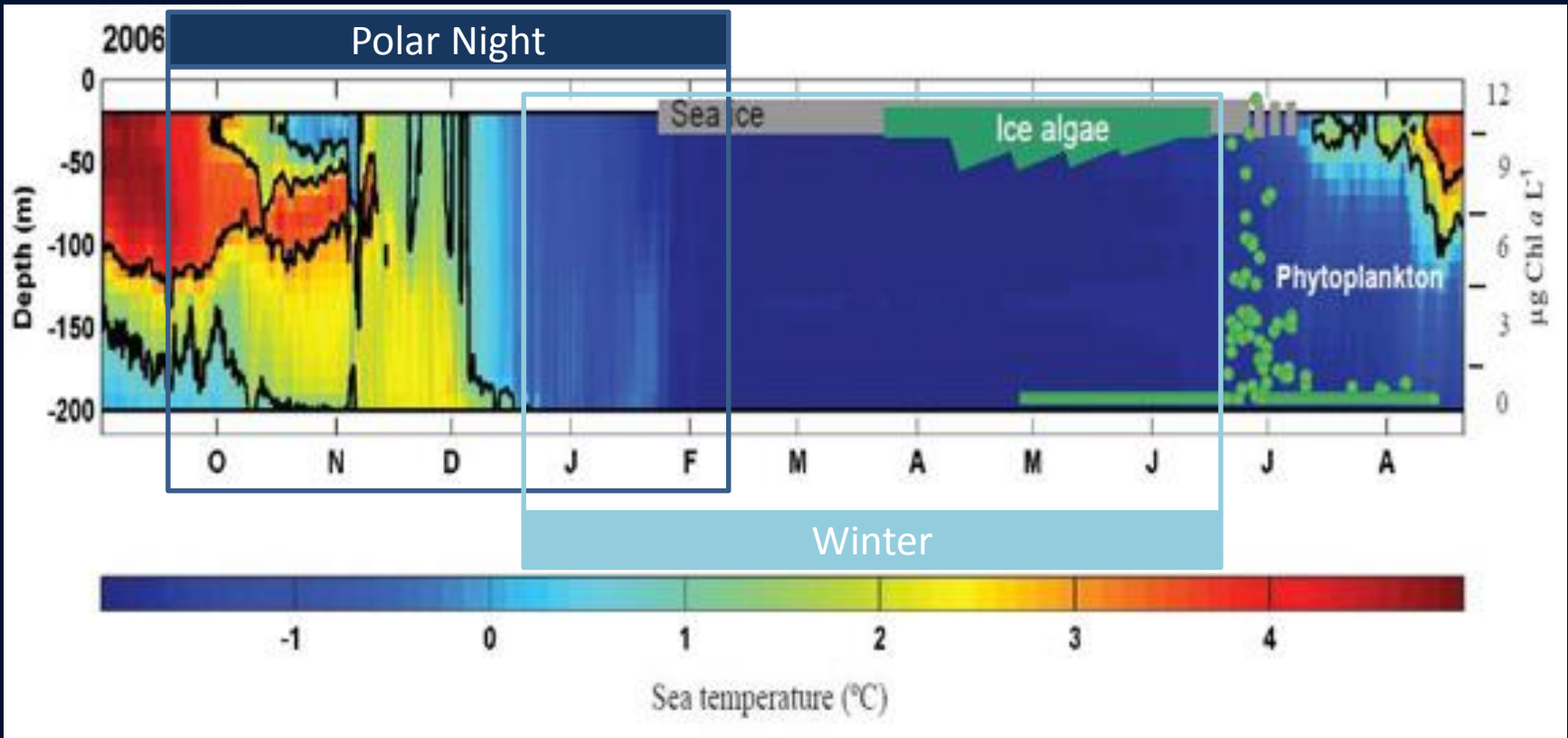
It is not equally dark across the Arctic



Polar night \neq Polar night



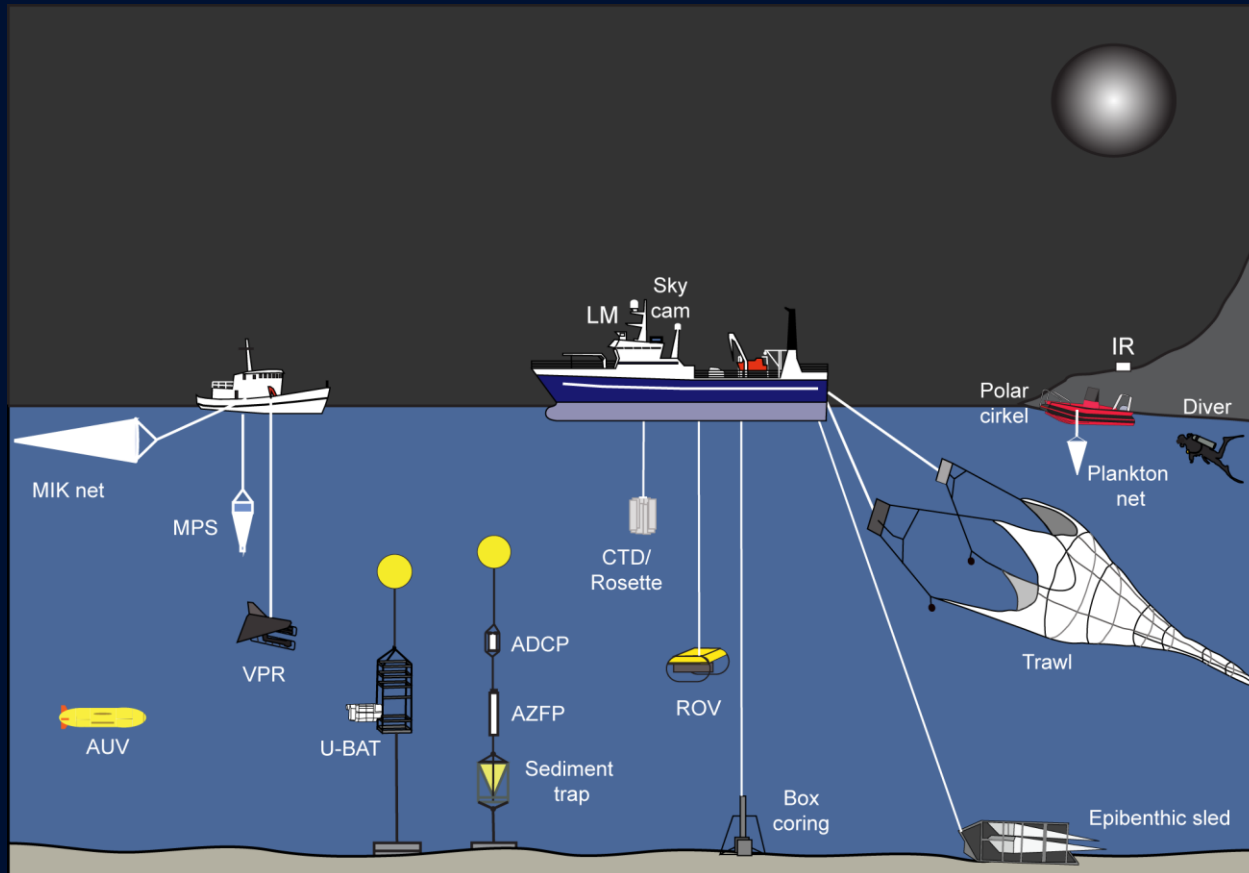
Polar night vs Winter



- There can be light in winter
- It can be «warm» during the polar night



Marine Night cruise & field campaign Kongsfjorden (79°N) January 2014-2015

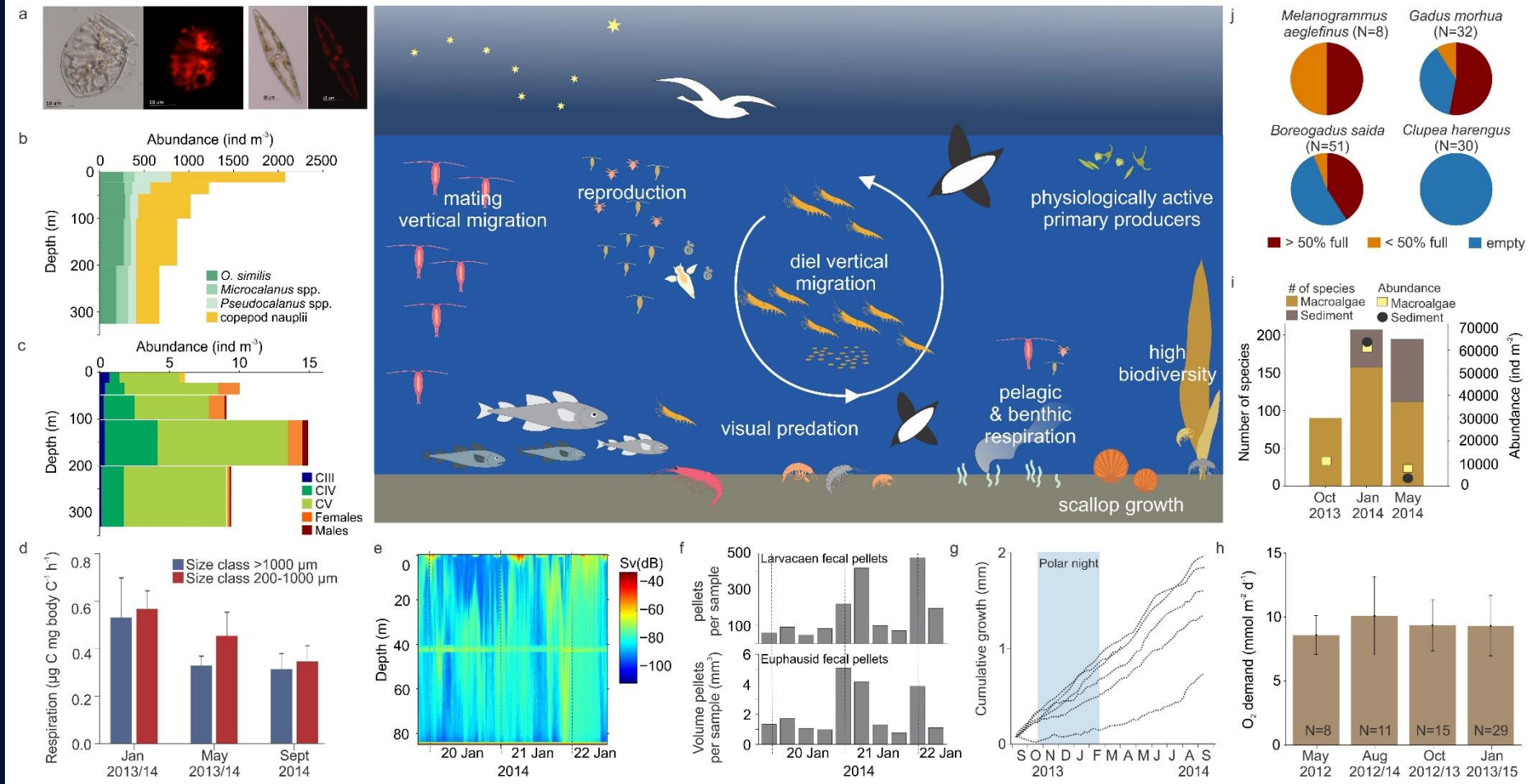


In co-laboration with:

AB334/834: Underwater robotics and polar night biology (UNIS)

BIO-8510 ARCTOS - Marine ecological research cruise to Svalbard (UiT)

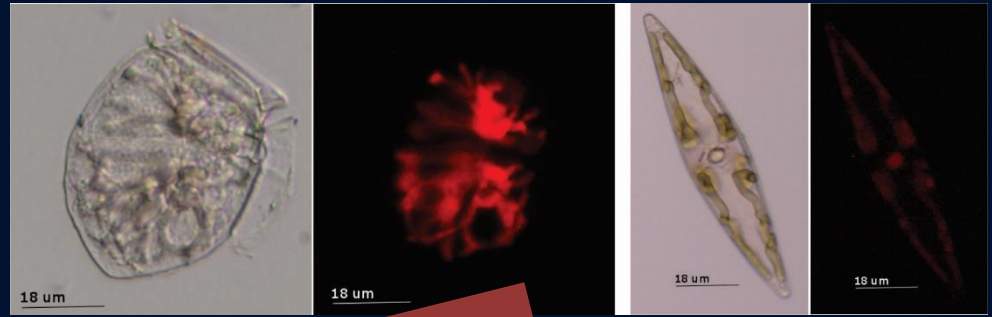
Biological process during the polar night in Kongsfjorden



Primary producers



Primary producers



Primary producers are physiologically active and able to rapidly commence photosynthesis as soon as light returns

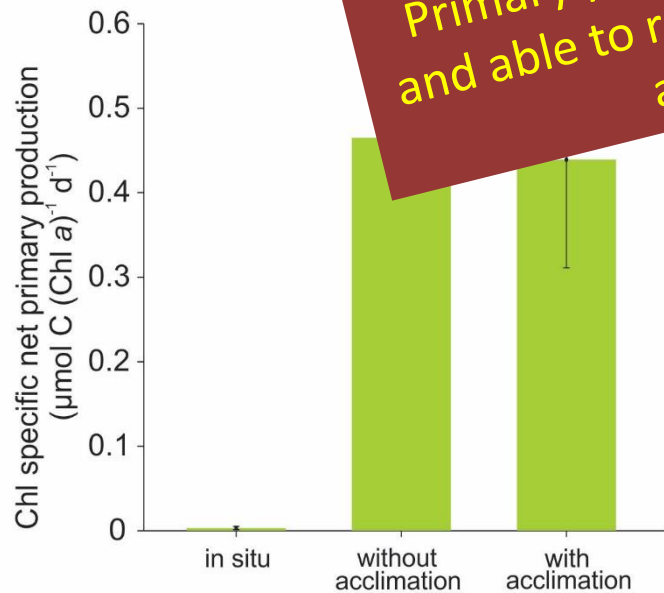
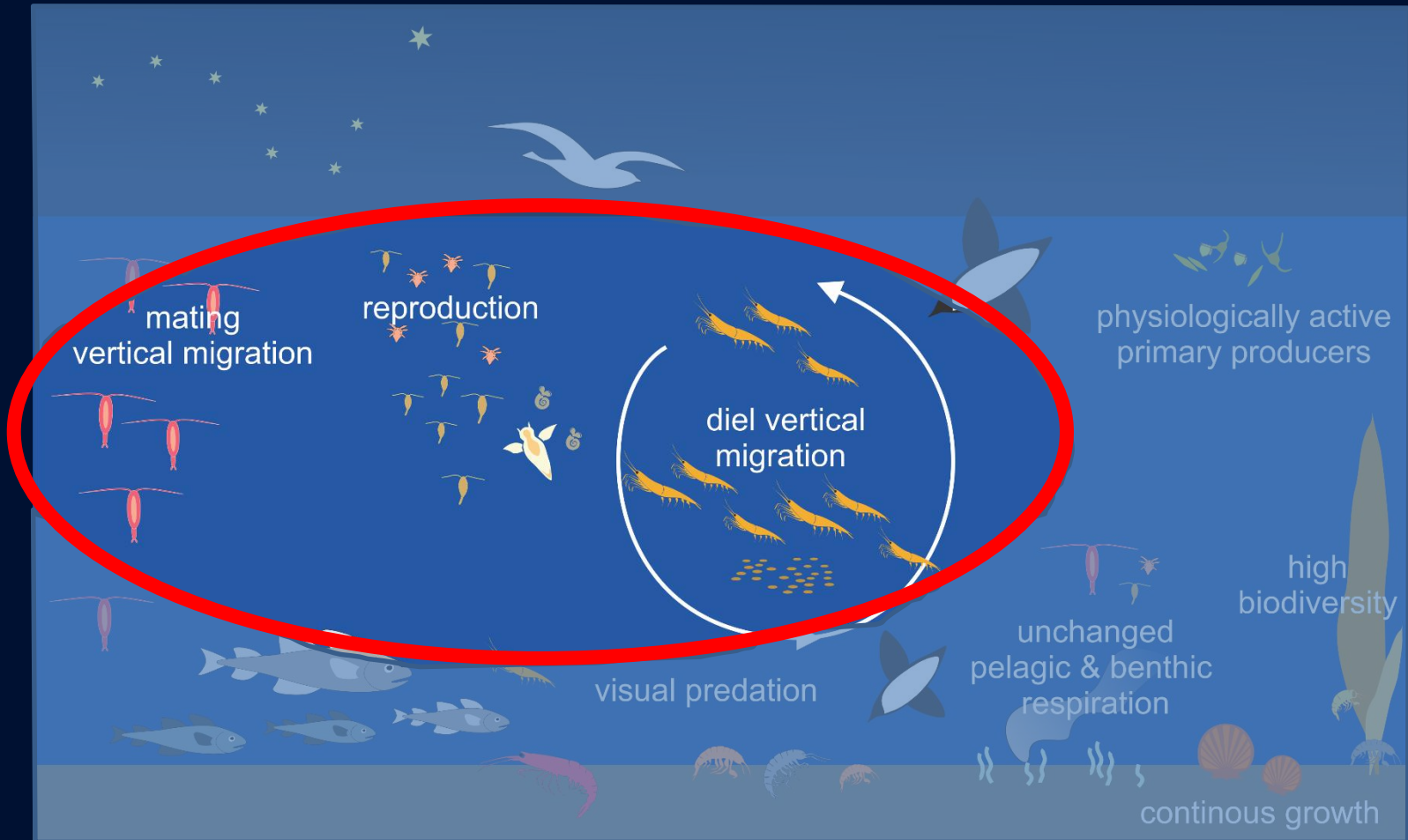
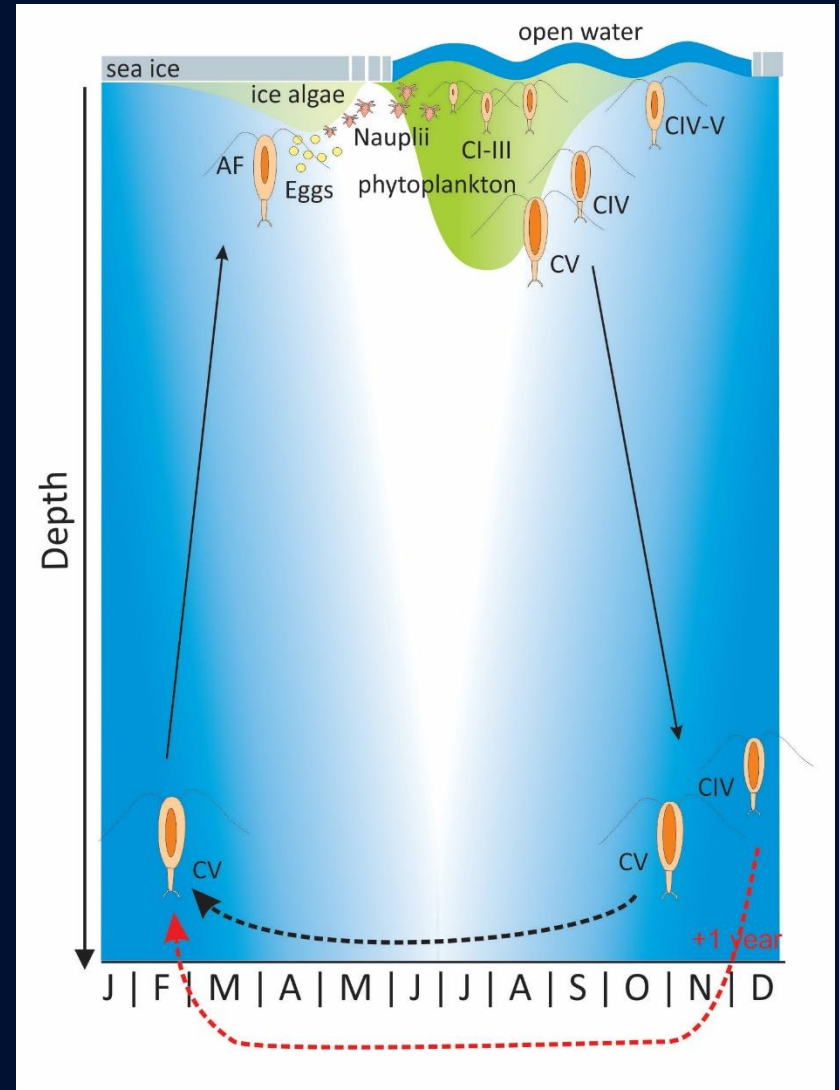


Foto: Jan Sivert Hauglid

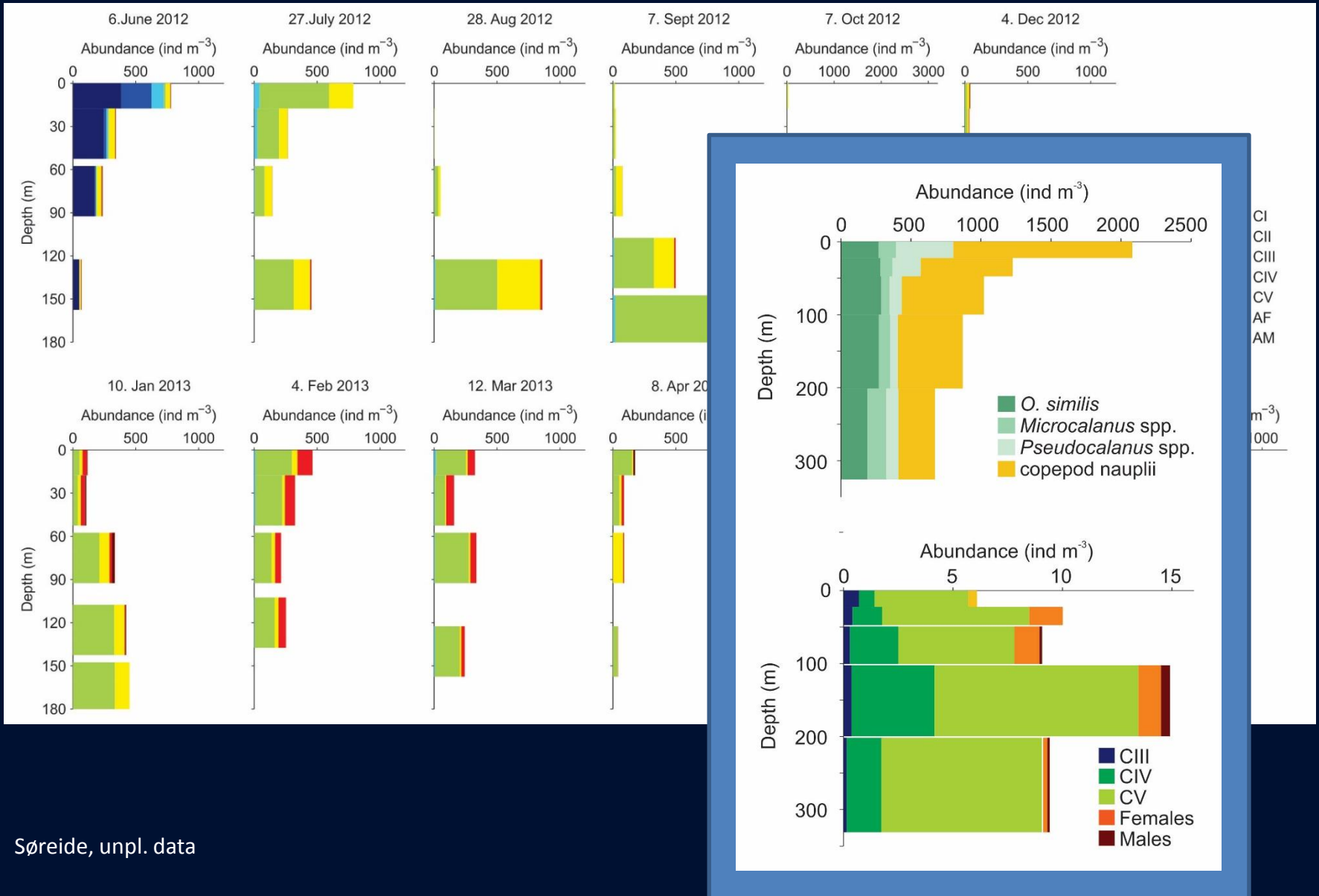
Zooplankton



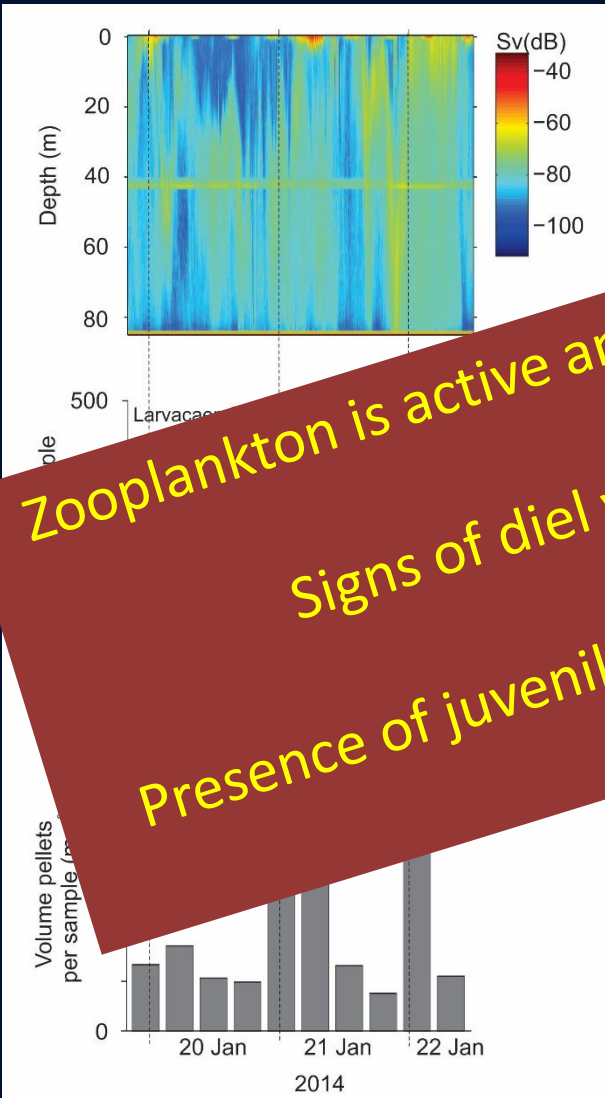
Zooplankton



The season in Billefjorden: vertical distribution of *C. glacialis*



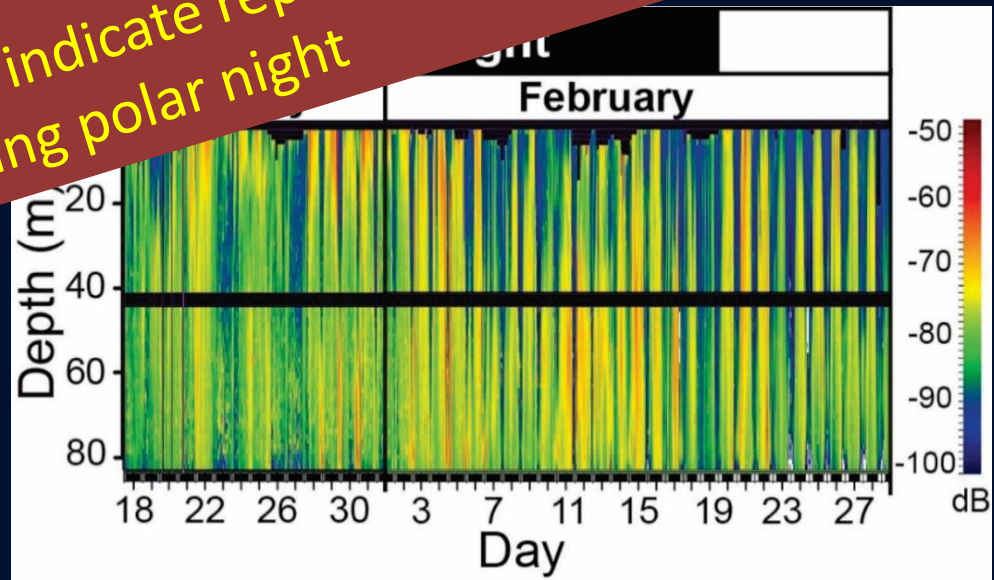
Zooplankton



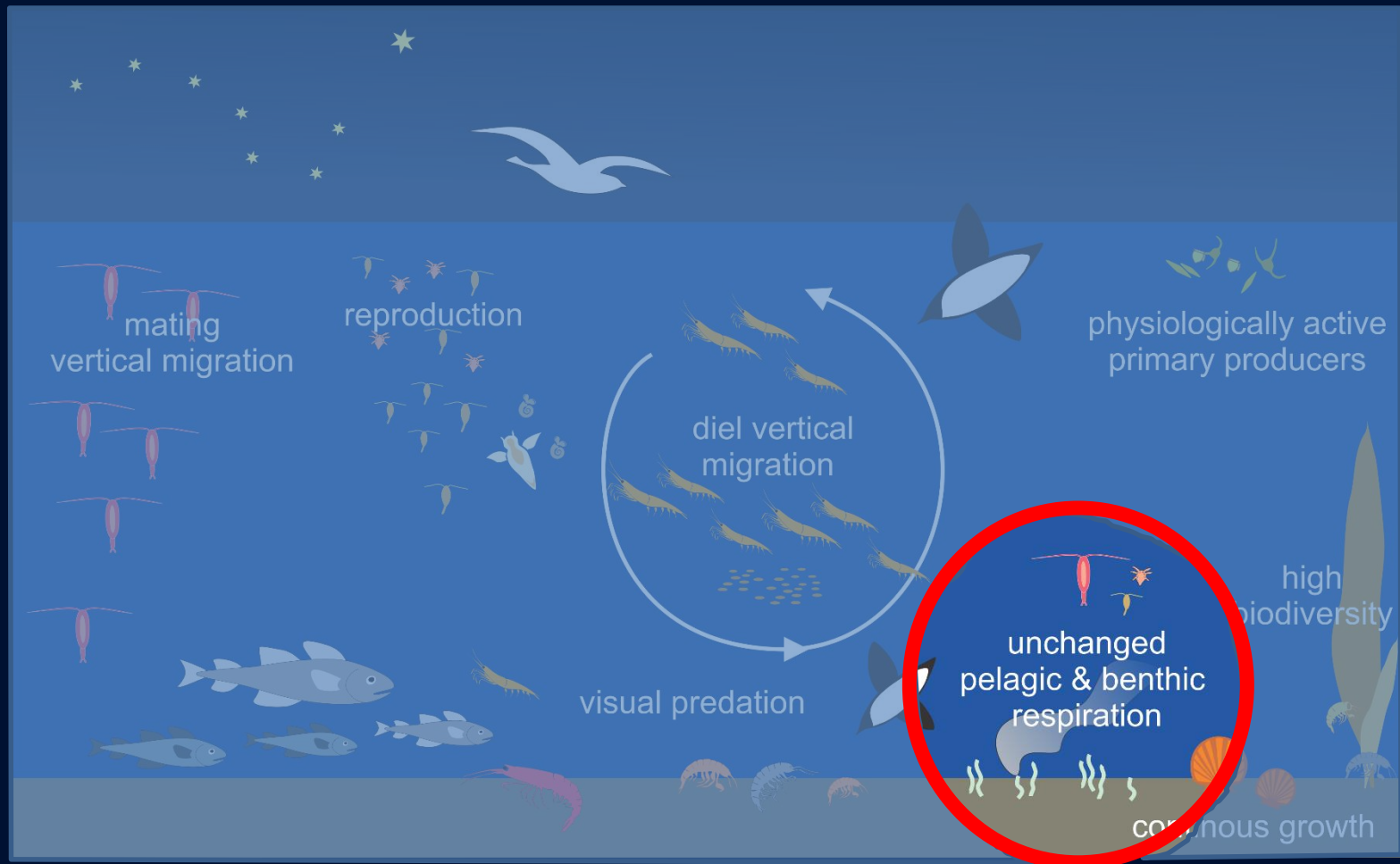
Zooplankton is active and distributed over the entire water column

Signs of diel vertical migration and active feeding

Presence of juveniles stages indicate reproduction in several taxa during polar night

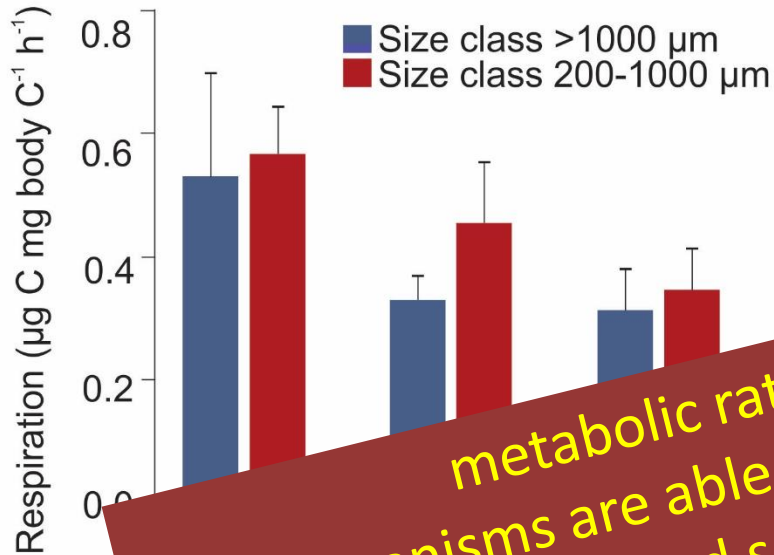


Respiration

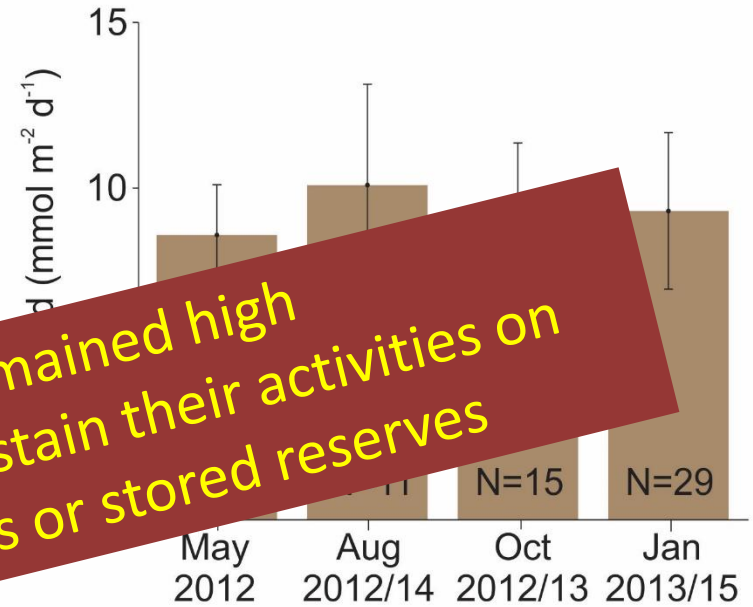


Respiration

zooplankton



benthos



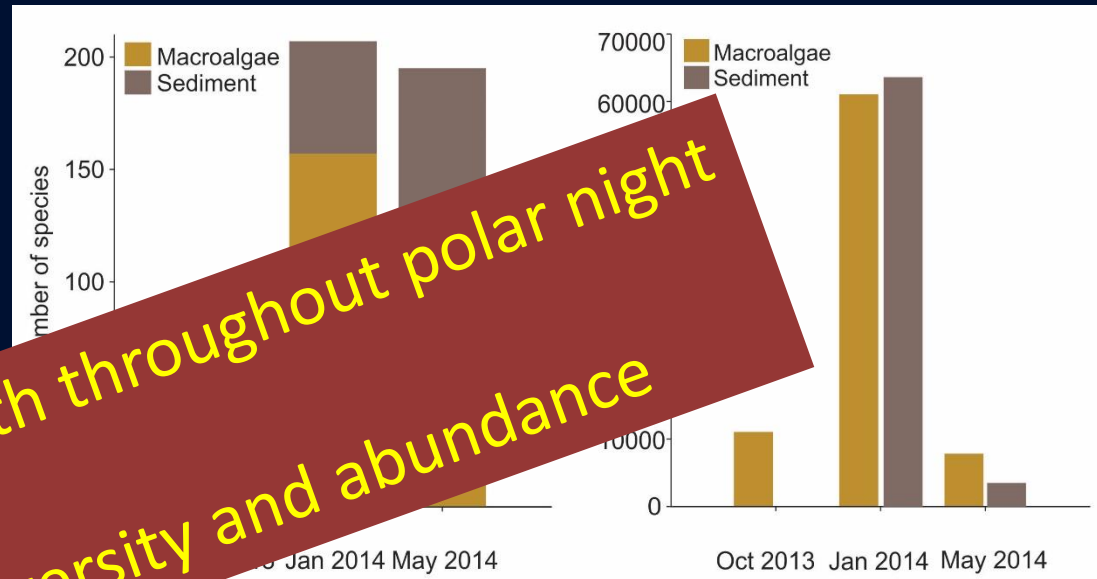
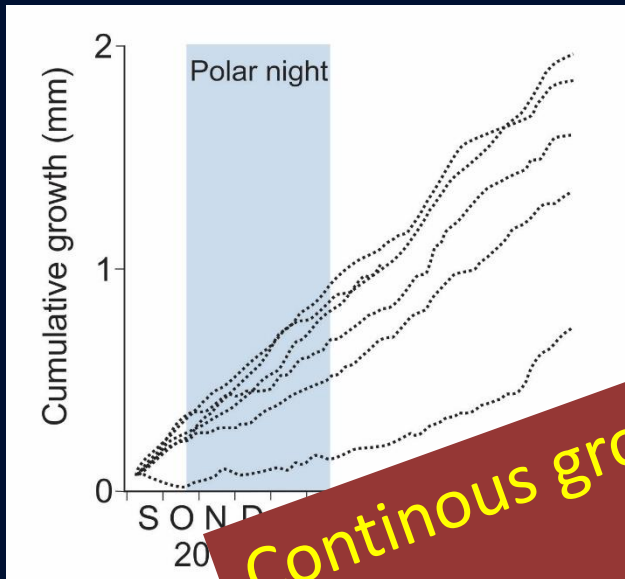
metabolic rates remained high
=> organisms are able to sustain their activities on
alternative food sources or stored reserves



Benthic activity



Benthic activity

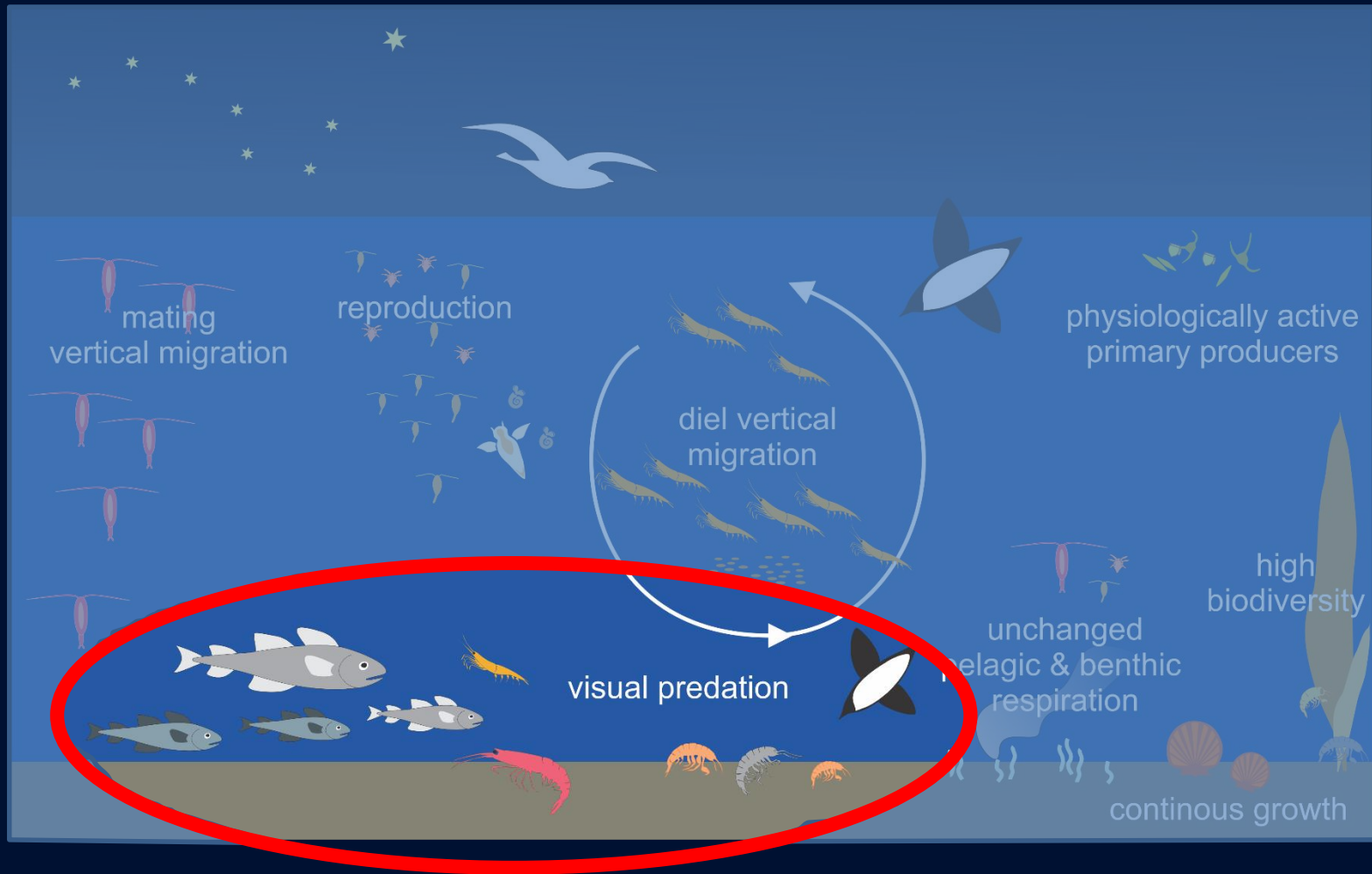


Continuous growth throughout polar night

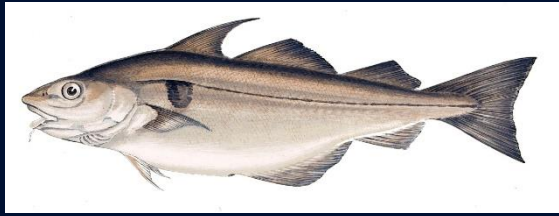
High biodiversity and abundance



Visual predation



Fish diet



Hyse



Torsk



Polar torsk

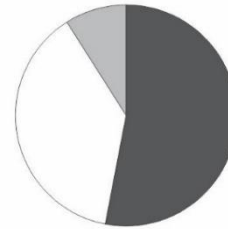


Herring

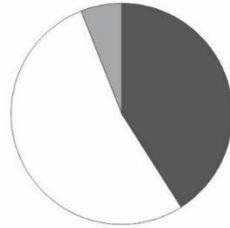
Melanogrammus aeglefinus (N=8)



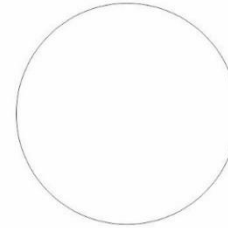
Gadus morhua (N=32)



Boreogadus saida (N=51)



Clupea harengus (N=30)



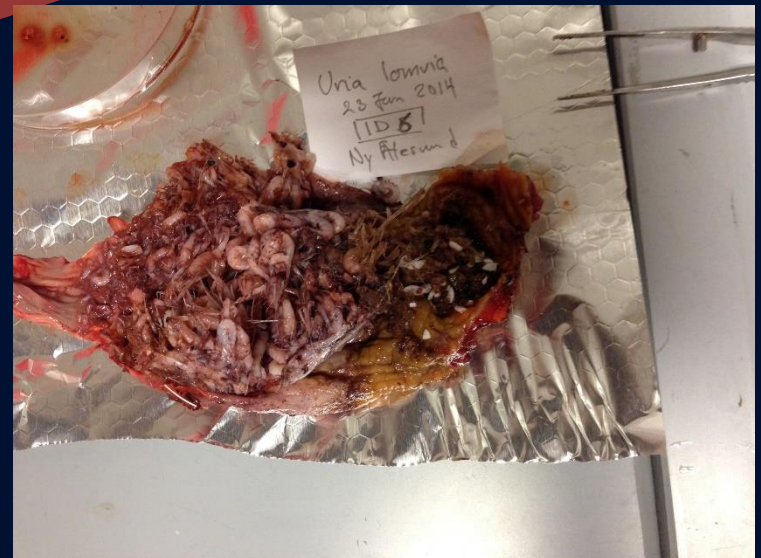
> 50% full
 < 50% full
 empty



Bird diet



Predation by many Arctic species does not seem to be as visually oriented as expected. Successful prey detection results in continued feeding during the polar night with full stomachs





The Arctic winter and polar night are emerging as key periods during which many reproductive and other ecological important processes occur

Relevance

Arctic opens up

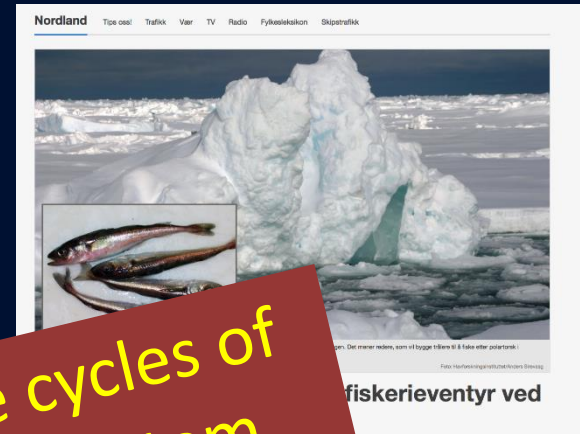
⇒ huge opportunities

⇒ but also great challenges
and environmental

Increased

⇒ increased risk of near-shore accident
during the polar night

⇒ Need to understand full life cycles of
Arctic organisms to assess ecosystem
vulnerability to environmental
disturbances

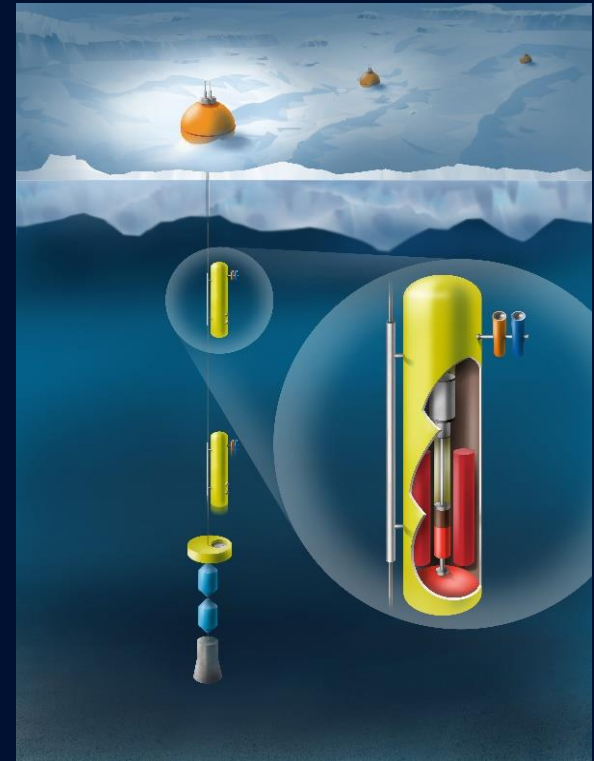


New project:

Automated platforms may be used to monitor ecosystems at remote locations and throughout the polar night

=> Our new course is the development of autonomous platforms from which scenarios may be assessed and tested

Project leader: J Berge (UiT and UNIS), project period 2015-2019
National institutions: APN, UNIS, UiT, NTNU, FNI and IMR
International institutions: **UK** (SAMS), **Canada** (Univ. Manitoba and ArcticNet), **USA** (Univ. of Delaware, Univ. of Alaska, WHOI, Univ. of Washington), **Japan** (WMU), **Russia** (AARI), **Germany** (IASS), **Korea** (KOPRI).



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